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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/118,945	07/17/1998	JAMES T. HURLEY	042390.P4661	9535

7590 05/04/2005

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EXAMINER	
GOOD JOHNSON, MOTILEWA	
ART UNIT	**PAPER NUMBER**
2675	

DATE MAILED: 05/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/118,945	HURLEY ET AL.
	Examiner	Art Unit
	Motilewa A. Good-Johnson	2675

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to communications: application, filed on 07/17/1998; IDS paper #3, filed on 07/17/1998; IDS, paper #8, filed on 11/13/2000; Amendment A, filed on 11/13/2000; Preliminary Amendment B, filed 07/23/2001; Amendment C, filed 03/24/2003; Amendment D, filed 11/03/2003; Amendment, filed 05/03/2004.

2. The present title of the application is "Extension of Fast Phong Shading Technique for Bump Mapping" (as originally filed).

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/03/2004 has been entered.

The advisory action mailed 08/09/2004, has been withdrawn.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaibara et al., U.S. Patent Number 4,709, 231, "Shading Apparatus for Displaying Three Dimensional Objects, 11/24/1987, in view of Miller et al., *On-the-Fly Texture Computation for Real-Time Surface Shading*, IEEE, 1998, pages 44-58.

Regarding claim 1, Sakaibara discloses a method for implementing mapping, comprising: generating a table of color values (col. 3, lines 58-59, tables corresponding to the green, blue and red component of light) for geometry of a polygon in view of a light source and a viewing direction of the polygon (abstract), the table of color values to be referenced by orientation-dependent color variables (col. 6, lines 30-57); determining vertex angle coordinates for a plurality of vertex vectors of the polygon (col. 4, lines 3-9, and lines 45-47); interpolating the vertex coordinates with vertex values of the vertices of the polygon (col. 4, lines 19-23) to provide angle coordinates for each pixel in the polygon, the angle coordinates representing a direction of the vertex vector at the pixel (col. 4, lines 24-44); and assigning the pixel a color value from the table of color values referenced by the one or more color variables (col. 3, lines 55-65, storing and accessing information to and from the table in frame buffers on dot by dot basis, which Examiner interprets as assigning pixel, i.e. dot, color information referenced by one or more color variables). Sakaibara further discloses coordinate transformation using displacement of axes if necessary, col. 3, lines 21-26.

However, it is noted that Sakaibara fails to disclose bump mapping including modifying the estimated angle coordinates using a perturbation source to generate perturbed angle coordinate; converting the perturbed angle coordinates to one or more color variables.

Miller discloses (displacement of the object using the objects scaling, page 49, col. 1, using bump mapping to display the vector); converting the perturbed angle coordinates to one or more color variables (transforming the bump mapped surface to model space, page 49, col. 2); and assigning the pixel a color value from the table of color values referenced by the one or more color variables (compute a table of 24-bit color value, and using the look up to find the corresponding entry in a lighting table, page 49, col. 2)

It would have been obvious to one of ordinary skill in the art at the time of the invention to include in the high speed shading using polar coordinate system as disclosed in Sakaibara, the bump mapping displacement as disclosed in Miller, to reduce processing time and further provide high speed shading, for transformed coordinates or parallel displacement in shading operations.

Regarding claim 2, Miller discloses generating angle perturbations based on bump coordinates of each vertex of the polygon; and combining the angle perturbations with the angle coordinates to generate the perturbed angle coordinates (calculating displacement, which Examiner interprets as angle perturbations, using the normal vector angles to find the surface position to calculate the displacement scale, page 49, col. 1)

Regarding claim 3, Miller discloses estimating the bump coordinates for the pixel; and converting the bump coordinates to angle perturbations (relative displacement that scales linearly with the object, which Examiner interprets as estimating the bump coordinates, page 49, col. 1)

Regarding claim 4, Miller discloses wherein converting the bump coordinates comprises retrieving angle perturbations from a bump map location referenced by the bump coordinates (avoiding the recomputing of deflected normal by precomputing and caching them and using a table to look up the values, page 49, col. 2)

Regarding claim 5, Sakaibara discloses wherein the plurality of vertex vectors includes at least one of a normal vector, a light source vector, and a halfway vector between the light source vector and a viewing direction of the polygon (col. 1, lines 31-39, figure 2)

Regarding claim 6, Miller discloses determining bump coordinates for vertices of the polygon; interpolating bump coordinates for the pixel from the determined vertex bump coordinates (computing bump mapped normals and interpolating the light vector from the normal, page 51, col. 1)

Regarding claim 7, Sakaibara discloses a graphics system comprising: a geometry engine to associate vector orientation data with vertices of one or more polygons representing an object in an image (col. 3, lines 20-30 and Miller further discloses using standard rendering engines, page 45, col. 1); a color map including color values for a sample of vector orientations, each color value to be referenced by one or more orientation dependent color variable (color tables, col. 38-40, which

Examiner interprets as a color map); determining vertex angle coordinates for a plurality of vertex vectors of the polygon (col. 4, lines 3-9, and lines 45-47); interpolating the vertex coordinates with vertex values of the vertices of the polygon (col. 4, lines 19-23) to provide angle coordinates for each pixel in the polygon, the angle coordinates representing a direction of the vertex vector at the pixel (col. 4, lines 24-44); and assigning the pixel a color value from the table of color values referenced by the one or more color variables (col. 3, lines 55-65, storing and accessing information to and from the table in frame buffers on dot by dot basis, which Examiner interprets as assigning pixel, i.e. dot, color information referenced by one or more color variables). Sakaibara further discloses coordinate transformation using displacement of axes if necessary, col. 3, lines 21-26.

However, it is noted that Sakaibara fails to disclose a perturbation source to provide orientation perturbations and modifying the angle coordinates using a perturbation source to generate perturbed angle coordinates; converting the perturbed angle coordinates to one or more color variables.

Miller discloses (displacement of the object using the objects scaling, page 49, col. 1, using bump mapping to display the vector); converting the perturbed angle coordinates to one or more color variables (transforming the bump mapped surface to model space, page 49, col. 2); and assigning the pixel a color value from the table of color values referenced by the one or more color variables (compute a table of 24-bit color value, and using the look up to find the corresponding entry in a lighting table, page 49, col. 2)

It would have been obvious to one of ordinary skill in the art at the time of the invention to include in the high speed shading using polar coordinate system as disclosed in Sakaibara, the bump mapping displacement, i.e. perturbation source, as disclosed in Miller, to reduce processing time and further provide high speed shading, for transformed coordinates or parallel displacement in shading operations.

Regarding claim 8, Miller discloses the orientation-dependent color variables are linearly related to angle coordinates that specifies the sampled vector orientation (discloses computing the lighting table using spherical polar parameterization, page 47, col. 1)

Regarding claim 9, Miller discloses wherein the perturbation source is a bump map including angle perturbations referenced by the perturbation coordinates (bump mapping to deflect the surface normal before shading, page 49, col. 1)

Regarding claim 10, Miller discloses rendering engine (page 55, col. 1) includes a generator that combines the angle coordinates and angle perturbations into perturbed color coordinates (table 1, page 49)

Regarding claim 11, Miller discloses the perturbation source is an algorithm for associating perturbations with polygon locations according to a property of the image. (an algorithm for computing bump map computation, page 49, col. 1)

Regarding claim 12, a machine readable medium on which are stored instructions that are executable by a system to implement a method for assigning a color values to an image pixel, the method comprising, it is rejected based upon similar rational as above independent claim 1.

Regarding claim 13, Miller discloses wherein modifying angle coordinates comprises: generating the angle perturbation for the pixel; and combining the angle perturbations with the angle coordinates to form perturbed angle coordinates (displacements that scale linearly with the object, page 49, col. 1)

Regarding claim 14, Sakaibara discloses wherein the plurality of vertex vectors includes at least one of a normal vector, a light source vector, and a halfway vector between the light source vector and a viewing direction of the polygon (col. 1, lines 30-39, also figure 2)

Regarding claim 15, it is rejected based upon similar rational as above independent claim 7.

Regarding claims 16 and 17 respectively, see above rejection for dependent claims 9 and 10.

Regarding claim 18, Sakaibara discloses a system comprising: a graphics pipeline (figure 1) see also above rejection for claim 1.

Regarding claim 19, Miller discloses wherein each color value is associated with first and second angle coordinates through one or more angle coordinates that index the color value (the precomputed values in the look up table correspond to an array of spherical-polar indices, page 49, col. 2)

Regarding claim 20, Miller discloses wherein the graphics pipeline includes texture-mapping hardware and the color values are accessed using the texture mapping hardware, (using hardware that implements texture mapping, page 45, col. 1)

Regarding claim 21, see above rejection for claim 1.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Motilewa A. Good-Johnson whose telephone number is (571) 272-7658. The examiner can normally be reached on Monday, Tuesday and Thursday 9:00 AM - 6:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sumati Lefkowitz can be reached on (571) 272-3638. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Motilewa A. Good-Johnson
Examiner
Art Unit 2675

mgj

Sumati Lefkowitz

SUMATI LEFKOWITZ
SUPERVISORY PATENT EXAMINER